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Measuring the speed of sound in the QGP with the CMS experiment

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A hot and dense matter exhibiting collective flow behavior with almost no viscous dissipation has been discovered in ultrarelativistic nuclear collisions. To experimentally constrain the equation of state of this matter, we present a measurement of its speed of sound using head-on lead-lead collision data collected by the CMS experiment at a center-of-mass energy per nucleon pair of 5.02 TeV. The measurement uses an analysis of the observed charged multiplicity dependence of the average particle transverse momentum in ultracentral events (impact parameter of nearly zero), a variable which probes the system temperature as a function of entropy density at a fixed volume. Results are compared with hydrodynamic simulations and lattice QCD predictions of the equation of state at high temperatures and small chemical potential. Implications for the exploration of the QCD phase structure and the search for a critical point are discussed.

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Classification de thématique: Bulk matter phenomena, QCD phase diagram and Critical point